

What is claimed is:

1. A liquid level gage, comprising:
 - a housing having a first end and a second end;
 - a liquid column connected to the first end of the housing, the liquid column including a plurality of liquid column bodies and a plurality of port assemblies, wherein a pair of port assemblies is connected to each liquid column body; and
 - an illuminator connected to the second end of the housing, the illuminator including a plurality of directed light source assemblies, wherein:
 - half of the directed light source assemblies emit a first color light and half of the directed light sources emit a second color light,
 - a pair of bi-color directed light source assemblies corresponds to each liquid column body and pair of port assemblies, and
 - each pair of bi-color directed light source assemblies is oriented with respect to the corresponding liquid column body and pair of port assemblies in such a way that the first color light passes through the corresponding liquid column body and pair of port assemblies when a liquid is present in the corresponding liquid column body and the second color light passes through the corresponding liquid column body and pair of port assemblies when a non-liquid is present in the corresponding liquid column body.
2. The liquid level gage of claim 1, wherein each directed light source assembly emitting the first color light is a green directed light source assembly and each directed light source assembly emitting the second color light is a red directed light source assembly.
3. The liquid level gage of claim 2, wherein
 - an angle between a line passing through a center of the green directed light source assembly to a line passing through a center of the corresponding liquid column body is in the range of 0-25 degrees; and
 - an angle between a line passing through a center of the red directed light source assembly to the line passing through the center of the corresponding liquid column body is in the range of 0-25 degrees.

4. The liquid level gage of claim 3, wherein
the angle between the line passing through the center of the green directed light source assembly to the line passing through the center of the corresponding liquid column body is in the range of 0-10 degrees; and
the angle between the line passing through the center of the red directed light source assembly to the line passing through the center of the corresponding liquid column body is in the range of 0-10 degrees.
5. The liquid level gage of claim 4, wherein
the angle between the line passing through the center of the green directed light source assembly to the line passing through the center of the corresponding liquid column body is approximately 7.1 degrees; and
the angle between the line passing through the center of the red directed light source assembly to the line passing through the center of the corresponding liquid column body is approximately 3.6 degrees.
6. The liquid level gage of claim 3, wherein:
an angle between a line passing through a center of each port assembly and the line passing through the center of the corresponding liquid column body is approximately 10 degrees.
7. The liquid level gage of claim 2, wherein each green directed light source assembly includes a green light emitting diode and each red directed light source assembly includes a red light emitting diode.
8. The liquid level gage of claim 2, wherein each green directed light source assembly includes a reflecting cup and each red directed light source assembly includes a reflecting cup.

9. The liquid level gage of claim 2, wherein each green directed light source assembly includes a focusing lens and each red directed light source assembly includes a focusing lens.

10. The liquid level gage of claim 2, wherein the liquid is water.

11. A liquid level gage, comprising:

a housing having a front end and a rear end;

a liquid column connected to the front end of the housing, the liquid column including a plurality of liquid column bodies and a plurality of port assemblies, wherein:

a pair of port assemblies is connected to each liquid column body, and

an angle between a line passing through a center of each port assembly and a line passing through a center of the corresponding liquid column body is approximately 10 degrees; and

an illuminator connected to the rear end of the housing, the illuminator including a plurality of green light emitting diode assemblies and a plurality of red light emitting diode assemblies, wherein:

a green light emitting diode assembly and a red light emitting diode assembly correspond to each liquid column body and pair of port assemblies,

an angle between a line passing through a center of the green directed light source assembly to the line passing through the center of the corresponding liquid column body is approximately 7.1 degrees, and

an angle between a line passing through a center of the red directed light source assembly to the line passing through the center of the corresponding liquid column body is approximately 3.6 degrees,

whereby the green light passes through the corresponding liquid column body and pair of port assemblies when a liquid is present in the corresponding liquid column body and the red light passes through the corresponding liquid column body and pair of port assemblies when a non-liquid is present in the corresponding liquid column body.

12. An illuminator for a liquid level gage, the liquid level gage including a housing having a first end and a second end and a liquid column connected to the first end of the housing, the liquid column including a plurality of liquid column bodies and a plurality of port assemblies, wherein a pair of port assemblies is connected to each liquid column body, the illuminator comprising:

a plurality of directed light source assemblies connected to the second end of the housing, wherein:

half of the directed light source assemblies emit a first color light and half of the directed light sources emit a second color light,

a pair of bi-color directed light source assemblies corresponds to each liquid column body and pair of port assemblies, and

each pair of bi-color directed light source assemblies is oriented with respect to the corresponding liquid column body and pair of port assemblies in such a way that the first color light passes through the corresponding liquid column body and pair of port assemblies when a liquid is present in the corresponding liquid column body and the second color light passes through the corresponding liquid column body and pair of port assemblies when a non-liquid is present in the corresponding liquid column body.

13. The liquid level gage of claim 12, wherein each directed light source assembly emitting the first color light is a green directed light source assembly and each directed light source assembly emitting the second color light is a red directed light source assembly.

14. The liquid level gage of claim 13, wherein

an angle between a line passing through a center of the green directed light source assembly to a line passing through a center of the corresponding liquid column body is in the range of 0-25 degrees; and

an angle between a line passing through a center of the red directed light source assembly to the line passing through the center of the corresponding liquid column body is in the range of 0-25 degrees.

15. The liquid level gage of claim 14, wherein
the angle between the line passing through the center of the green directed light source assembly to the line passing through the center of the corresponding liquid column body is in the range of 0-10 degrees; and
the angle between the line passing through the center of the red directed light source assembly to the line passing through the center of the corresponding liquid column body is in the range of 0-10 degrees.
16. The liquid level gage of claim 15, wherein
the angle between the line passing through the center of the green directed light source assembly to the line passing through the center of the corresponding liquid column body is approximately 7.1 degrees; and
the angle between the line passing through the center of the red directed light source assembly to the line passing through the center of the corresponding liquid column body is approximately 3.6 degrees.
17. The liquid level gage of claim 13, wherein each green directed light source assembly includes a green light emitting diode and each red directed light source assembly includes a red light emitting diode.
18. The liquid level gage of claim 13, wherein each green directed light source assembly includes a reflecting cup and each red directed light source assembly includes a reflecting cup.
19. The liquid level gage of claim 13, wherein each green directed light source assembly includes a focusing lens and each red directed light source assembly includes a focusing lens.
20. The liquid level gage of claim 13, wherein the liquid is water.

21. An illuminator for a liquid level gage, the liquid level gage including a housing having a front end and a rear end and a liquid column connected to the front end of the housing, the liquid column including a plurality of liquid column bodies and a plurality of port assemblies, wherein a pair of port assemblies is connected to each liquid column body and an angle between a line passing through a center of each port assembly and a line passing through a center of the corresponding liquid column body is approximately 10 degrees, the illuminator comprising:

a plurality of green light emitting diode assemblies and a plurality of red light emitting diode assemblies connected to the rear end of the housing, wherein:

a green light emitting diode assembly and a red light emitting diode assembly correspond to each liquid column body and pair of port assemblies,

an angle between a line passing through a center of the green directed light source assembly to the line passing through the center of the corresponding liquid column body is approximately 7.1 degrees, and

an angle between a line passing through a center of the red directed light source assembly to the line passing through the center of the corresponding liquid column body is approximately 3.6 degrees,

whereby the green light passes through the corresponding liquid column body and pair of port assemblies when a liquid is present in the corresponding liquid column body and the red light passes through the corresponding liquid column body and pair of port assemblies when a non-liquid is present in the corresponding liquid column body.